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(12) EUROPEAN PATENT APPLICATION

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(71) Applicant: BRITISH AEROSPACE PUBLIC LIMITED COMPANY
11 Strand
London WC2N 5JT(GB)

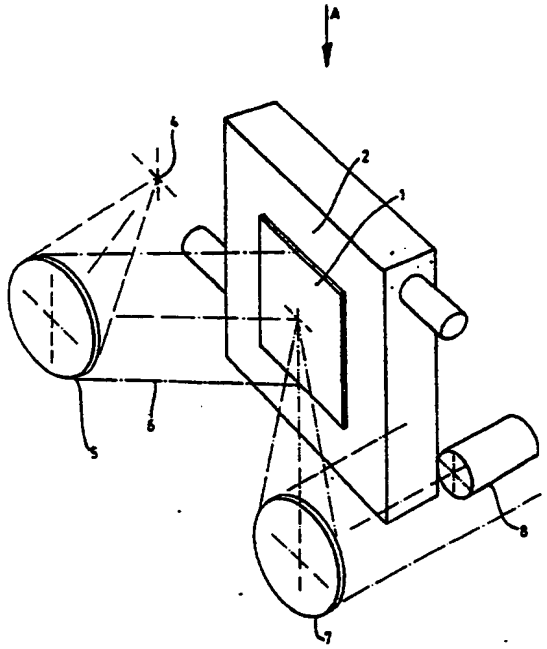
(72) Inventor: Fair, Martin Lewis
BRITISH AEROSPACE PLC P.O. Box 5
Filton Bristol BS12 7QW(GB)
Inventor: Roberts, John Calvin
BRITISH AEROSPACE PLC P.O. Box 5
Filton Bristol BS12 7QW(GB)

(74) Representative: Saul, David Jonathan et al
British Aerospace plc Corporate Patents
Dept. Brooklands Road
Weybridge Surrey KT13 0SJ(GB)

(54) Reflective picture generator.

(57) Apparatus for testing and/or calibrating a detector comprising a latent image generator, the generator having differing reflectance coefficients across its surface such that in use, when irradiated by collimated radiation the output intensity from some regions is relatively high and from other regions is relatively low.

Fig.1.



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REFLECTIVE PICTURE GENERATOR

This invention relates to apparatus for testing and/or calibrating a detector such as a thermal imaging device which may be attached to a missile or other projectile.

It has been proposed to test the imaging capabilities of a thermal imager by providing standard test scene plates for different test wavelengths. This technique is somewhat limited in that the test scene plates have to be changed for different wavelength ranges, which may impart a non-uniformity in the testing of the thermal imager.

It has also been proposed to test thermal imagers in situ in the field, this is also not wholly satisfactory. At different times of the day slight differences in conditions would render comparison of a number of thermal imagers inaccurate.

A third proposal has been to simulate a scene either by computer or electronically. As this requires a plurality of individually controlled elements it has proved both complex and costly.

One object of this invention is to provide a cheap, simple device which will allow a reproducible consistant image or scene to be used at any wavelength. This would give rise to a good control to be used reliably with any thermal imager, at any time.

According to one aspect of the invention there is provided apparatus for testing and/or calibrating a detector comprising a latent image generator, the generator having differing reflectance coefficients across its surface such that in use, when irradiated by collimated radiation the output intensity from some regions is relatively high and from other regions is relatively low. In other words no unintended radiation is detectable from an unilluminated image generator.

Preferably said latent image generator is a specular metal plate with a scene or landscape etched upon it such that the etched and non-etched portions give rise to respective relatively low and relatively high outputs of detectable radiation.

Preferably said optical means to direct radiation from a source onto said generator and from said generator onto the detector to be tested, comprises two concave collimating mirrors.

Advantageously said etched plate may form part of a rotatable drum.

Advantageously said generator should be suitably cooled to prevent excessive black body radiation at wavelengths within the test range of the detector.

Reference will now be made, by way of example, to the accompanying drawings, in which:-

Figure 1 is a perspective view of apparatus for testing and for calibrating detectors;

Figure 2 is a diagram of the device, in the general direction of Arrow A of Figure 1;

Figure 3 illustrates three different types of reflection from different surfaces, i.e.

a) specular reflection in a plane plate;

b) diffused reflection in a completely pitted plate; and,

c) 'frustrated' reflection in an etched plate.

Referring to Figures 1 and 2, a polished metal plate 1, suitably etched, is mounted on a cool surface 2. The metal plate is etched with a landscape scene, for example, the scene being formed by a plurality of pits 9 in the plate 1. In this embodiment the cool surface is one face of a chamber 3. Fluid is passed through the chamber in order to absorb heat from surface 2 and then dissipate it elsewhere.

A primary source of radiation 4 (for example a light bulb, IR source etc.) impinges on a concave mirror 5 such that a collimated beam of radiation 6 illuminates the etched plate. The radiation is reflected from the specular part of the plate and scattered by the pits forming the etching, as illustrated in Figure 3. The radiation reflected from the surface is scattered at different angles giving a polar distribution of reflectance. If the size of the pits 9 of the plate are approximately equal to the wavelength of the radiation then the polar distribution is equivalent to a Gaussian distribution. The radiation reflected from the plate is re-collimated by a second concaved mirror 7, in order to produce an intense image of the scene at the detector 8, to be tested. By slightly tilting the etched plate 1 the scattered radiation illuminates the mirror 7, giving rise to a low intensity negative contrast picture being detected at detector 8. Movement of the plate 1 within its own plane, simulates the detector under examination scanning the generated scene. In one embodiment of the present invention this could be achieved by mounting the plate on a rotatable drum (not shown).

The above system is for use typically, though not exclusively, with wavelengths ranging from far UV to far IR. The cooling surface 2 is used throughout this range, although it is only critical that it should be used for wavelengths from middle to far IR. This is due to the fact that articles at room temperature, or thereabouts, will naturally radiate in the middle to far IR wavelengths, (cf black body radiation laws) by cooling the articles, the radiation received from the collimated source which

partly serves to heat up the articles will be dissipated away, hence producing the 'noise'.

It should be noted that any forms of collimating means may be used rather than mirrors, e.g. lenses, however the spectral limitation of transmission optics restricts the wavelength that can be covered by the apparatus.

Claims

1. Apparatus for testing and/or calibrating a detector comprising a latent image generator, the generator having differing reflectance coefficients across its surface such that in use, when irradiated by collimated radiation the output intensity from some regions is relatively high and from other regions is relatively low.

2. Apparatus for testing and for calibrating a detector according to Claim 1, wherein said image plate is a specular metal plate with a scene or landscape etched upon it such that the etched and non-etched portions give rise to respective relatively low and relatively high outputs of detection radiation.

3. Apparatus according to Claim 1 or Claim 2, wherein said apparatus further includes optical means for directing radiation from a source onto said image generator and from said image generator onto a detector to be tested.

4. Apparatus according to any one of Claims 1, 2 or 3, wherein said optical means comprises two concave collimating mirrors.

5. Apparatus for testing and/or calibrating a detector according to any one of the preceding claims, wherein said etched plate may form part of a rotatable drum.

6. Apparatus for testing and/or calibrating a detector according to any one of the preceding claims, wherein said image generator should be suitably cooled to reduce undesired black body radiation at wavelengths within the test range of the detector.

7. Apparatus for testing and/or calibrating a detector substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 2 or Figure 3 of the accompanying drawings.

Fig.1.

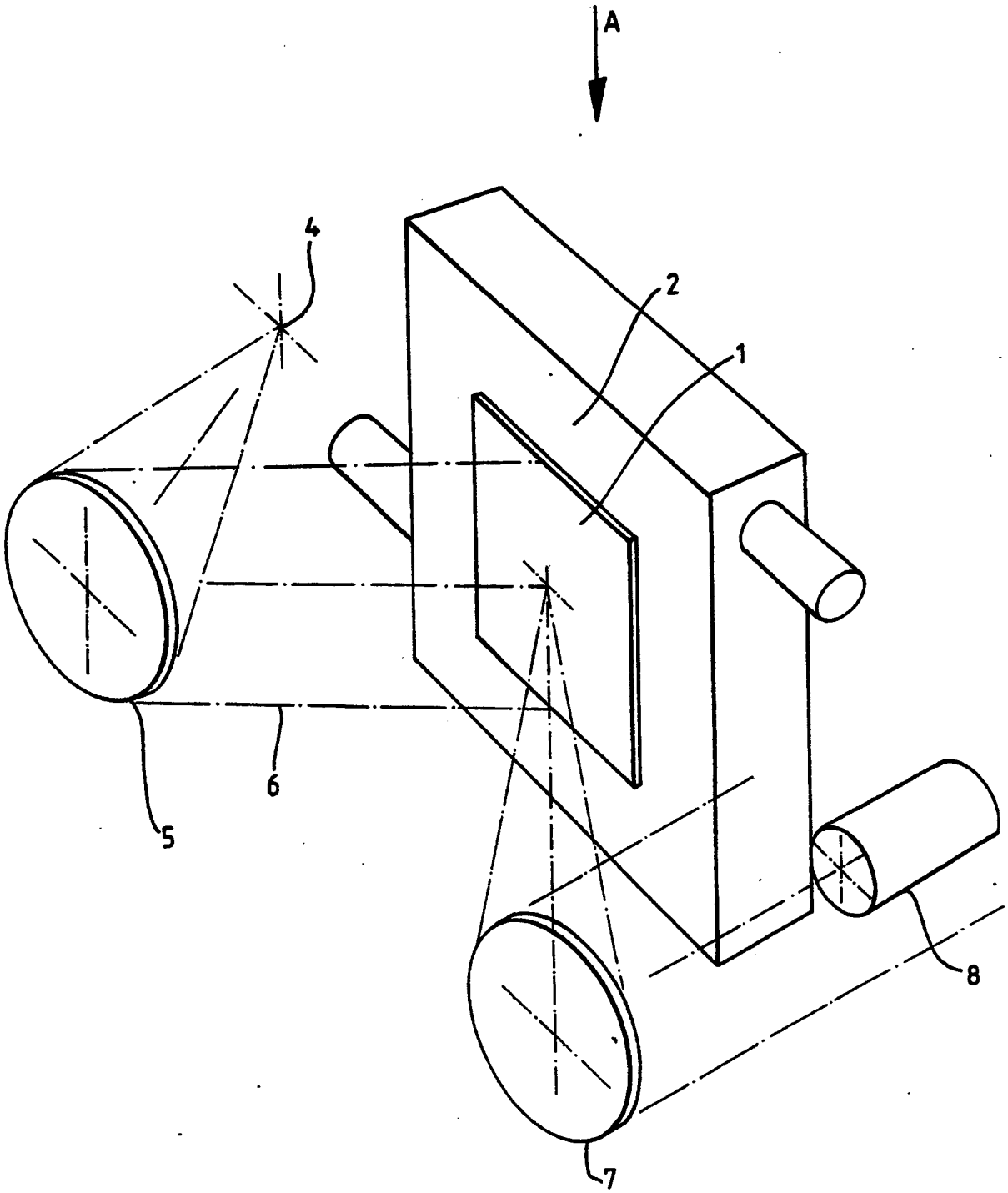


Fig.2.

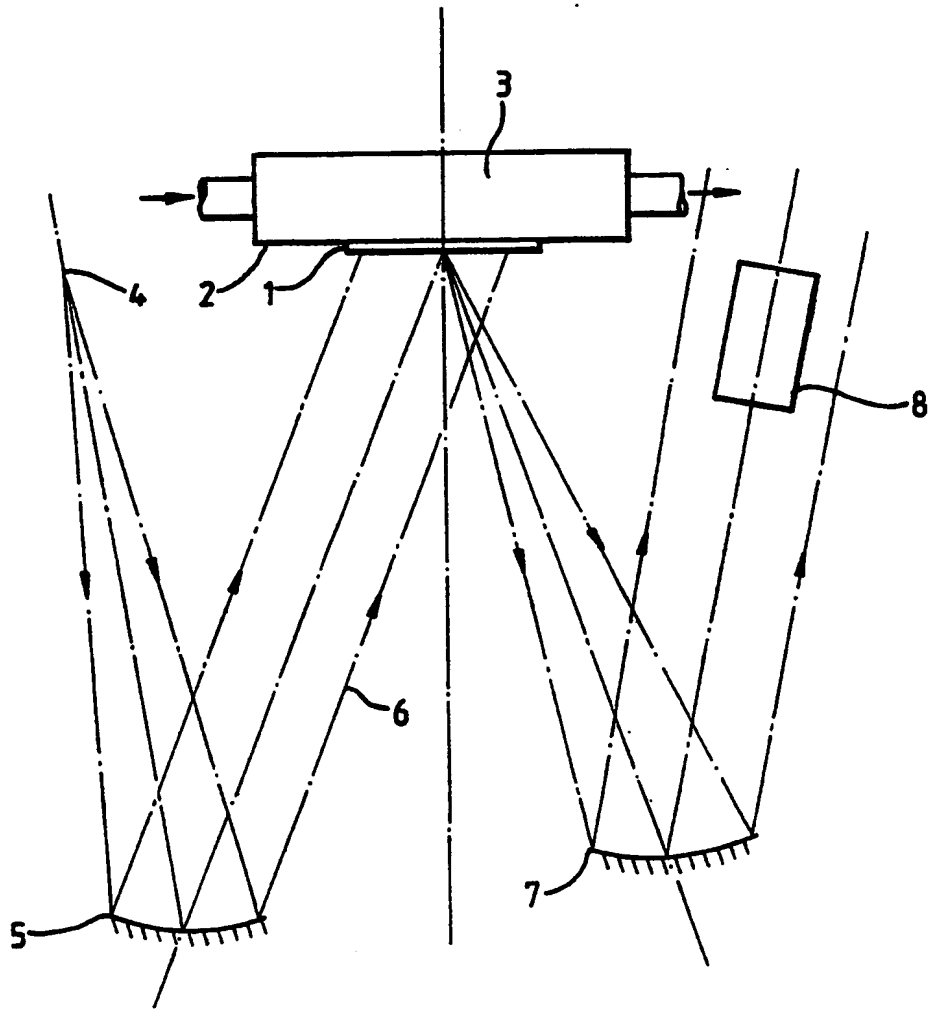
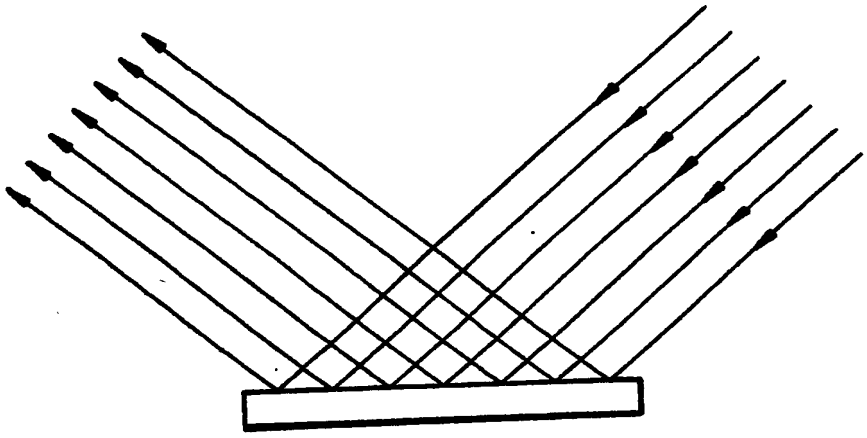
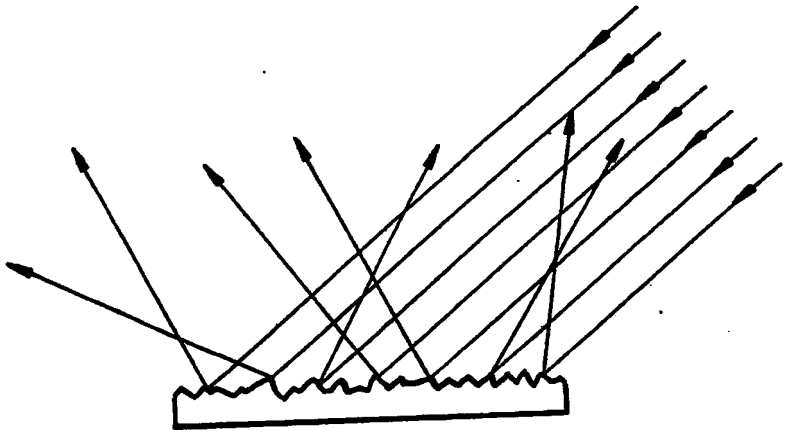


Fig.3.

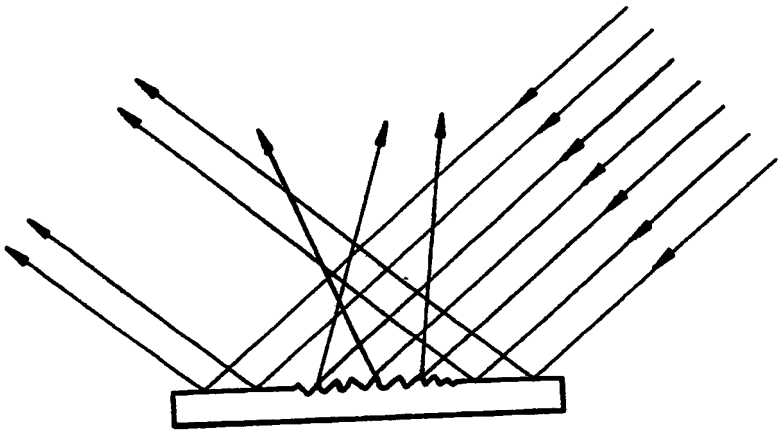
a)



b)



c)



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(71) Applicant: BRITISH AEROSPACE PUBLIC LIMITED COMPANY
11 Strand
London WC2N 5JT(GB)

(72) Inventor: Fair, Martin Lewis
BRITISH AEROSPACE PLC P.O. Box 5
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(74) Representative: Saul, David Jonathan et al
British Aerospace plc Corporate IPR Department, Headquarters P.O. Box 87
Building Q191 Royal Aerospace Establishment
Farnborough Hants GU14 6YU(GB)

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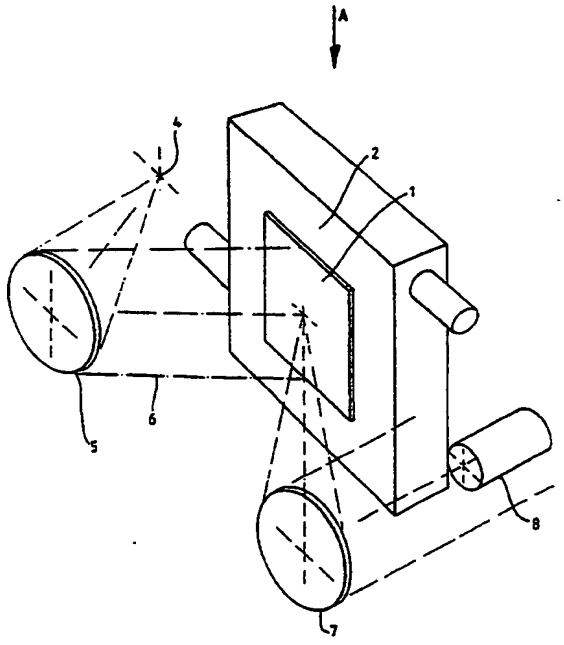

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EUROPEAN SEARCH REPORT

Application Number

EP 88 31 0300

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-3 478 211 (M. MOSER) * Column 3, lines 7-19; column 5, lines 36-41; claims 1,7 *	1	G 01 J 5/52 G 01 M 11/00
A	FR-A-1 532 223 (BARNES ENGINEERING CO.) * Abstract, points 1-4 *	1	
A	GB-A-2 184 861 (THE SECRETARY OF STATE FOR TRADE & IND.) * Page 1, lines 13-17; claims 1,18 *	1	
A	FR-A-2 593 284 (MESSERSCHMITT-BÖLKOW-BLOHM GmbH) * Claims 5,6 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

G 01 J
G 01 M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	05-06-1990	VAN DEN BULCKE E.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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